G-2 Tracker Electronics Proposal

(Conceptual design for cost estimate)

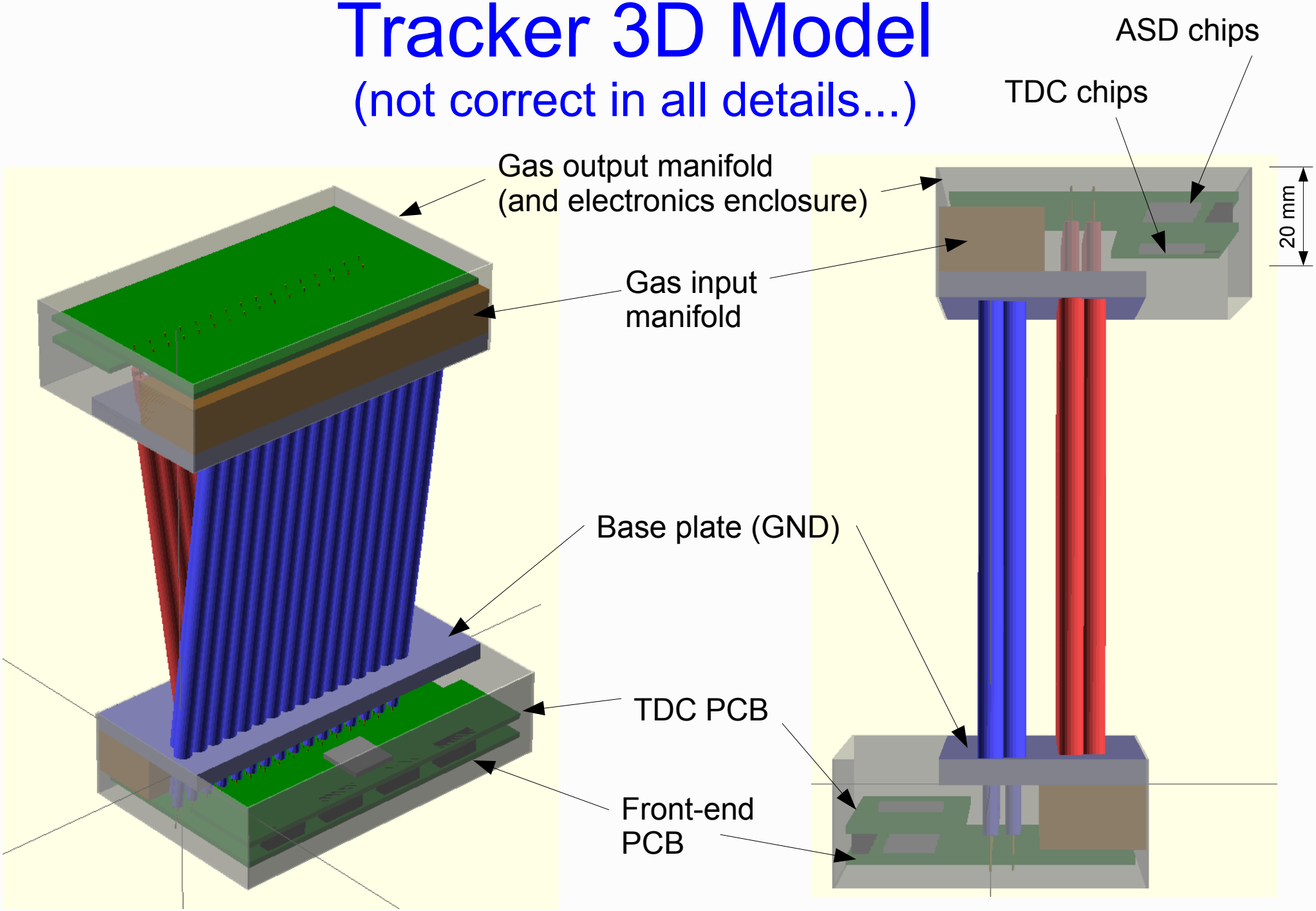
E. Hazen
Boston University

Key Tracker Electronics Requirements

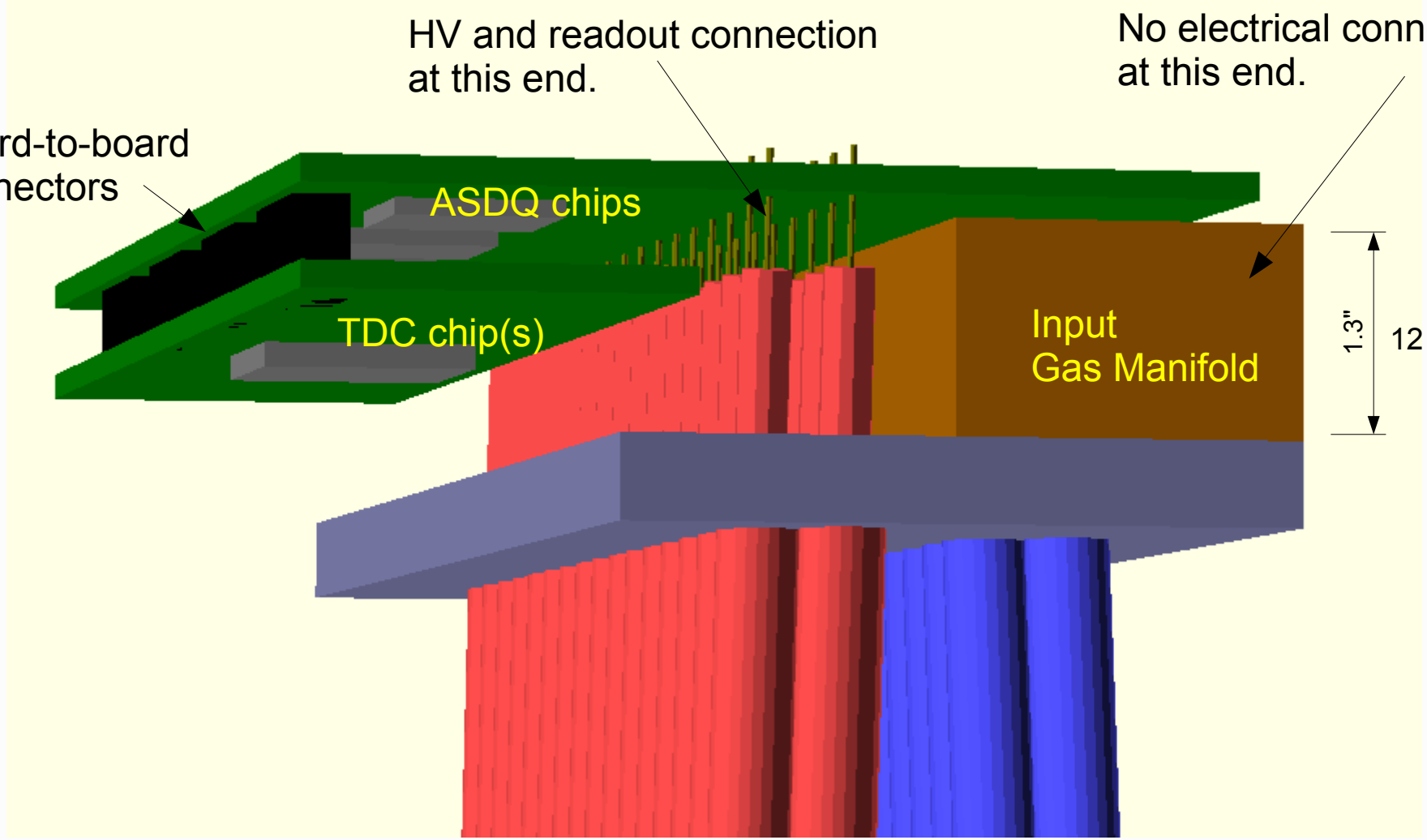
- Collect straw charge with suitable front-end
  - Good match to tube capacitance for efficient charge collection, appropriate preamp peaking time, timing discriminator
  - Surplus ASDQs from CDF are a good candidate
- Measure leading edge time on ~ 2k straws to ~1ns
  - FPGA TDC is a good candidate (as described by J.Wu *et al*)
- Readout within 11ns between spills
  - Data volume ~ 10k Bytes/fill for one traceback station
- Provide HV
- Fit within gas manifold; minimize power

Tracker 3D Model

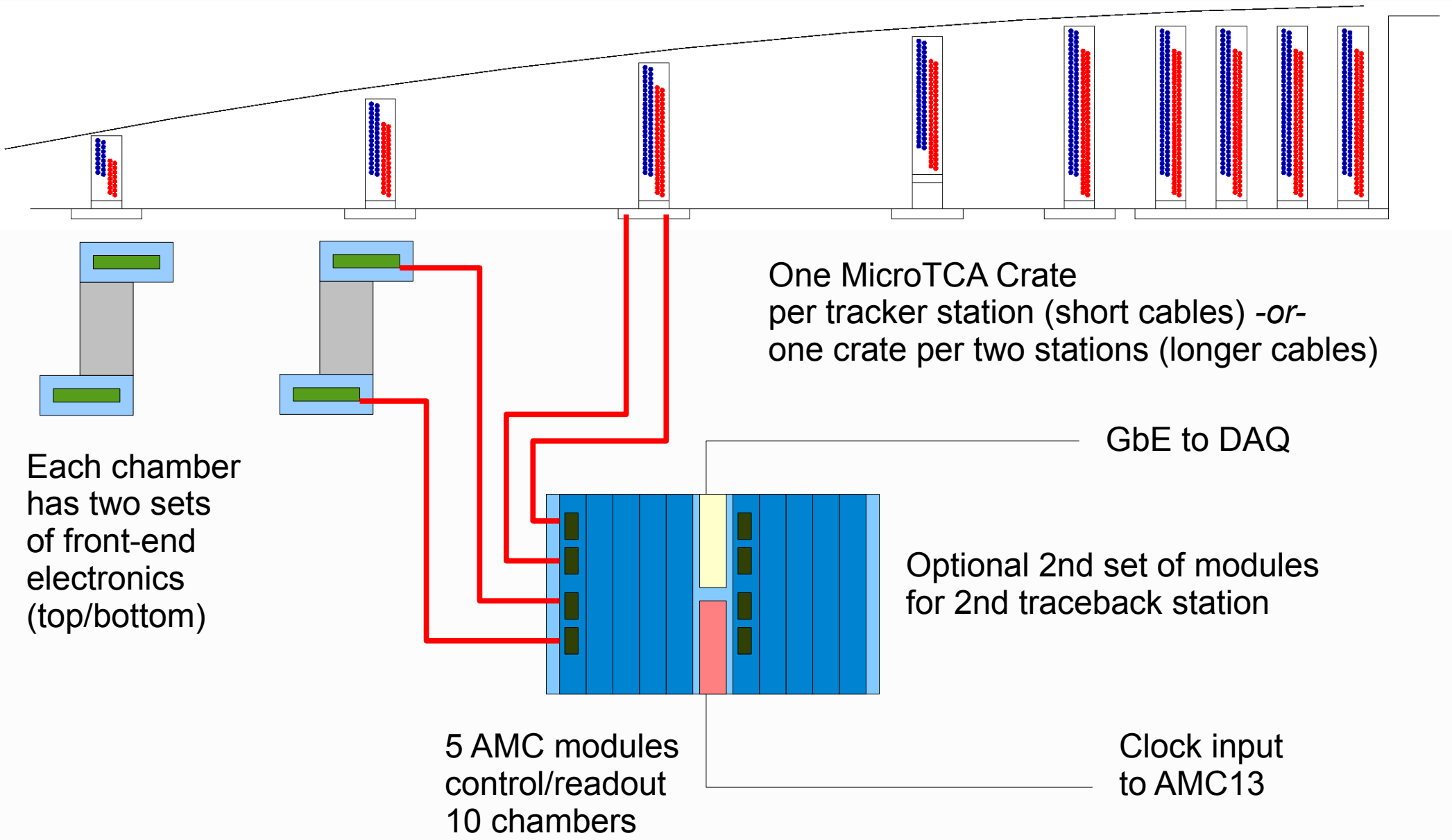
(not correct in all details...)



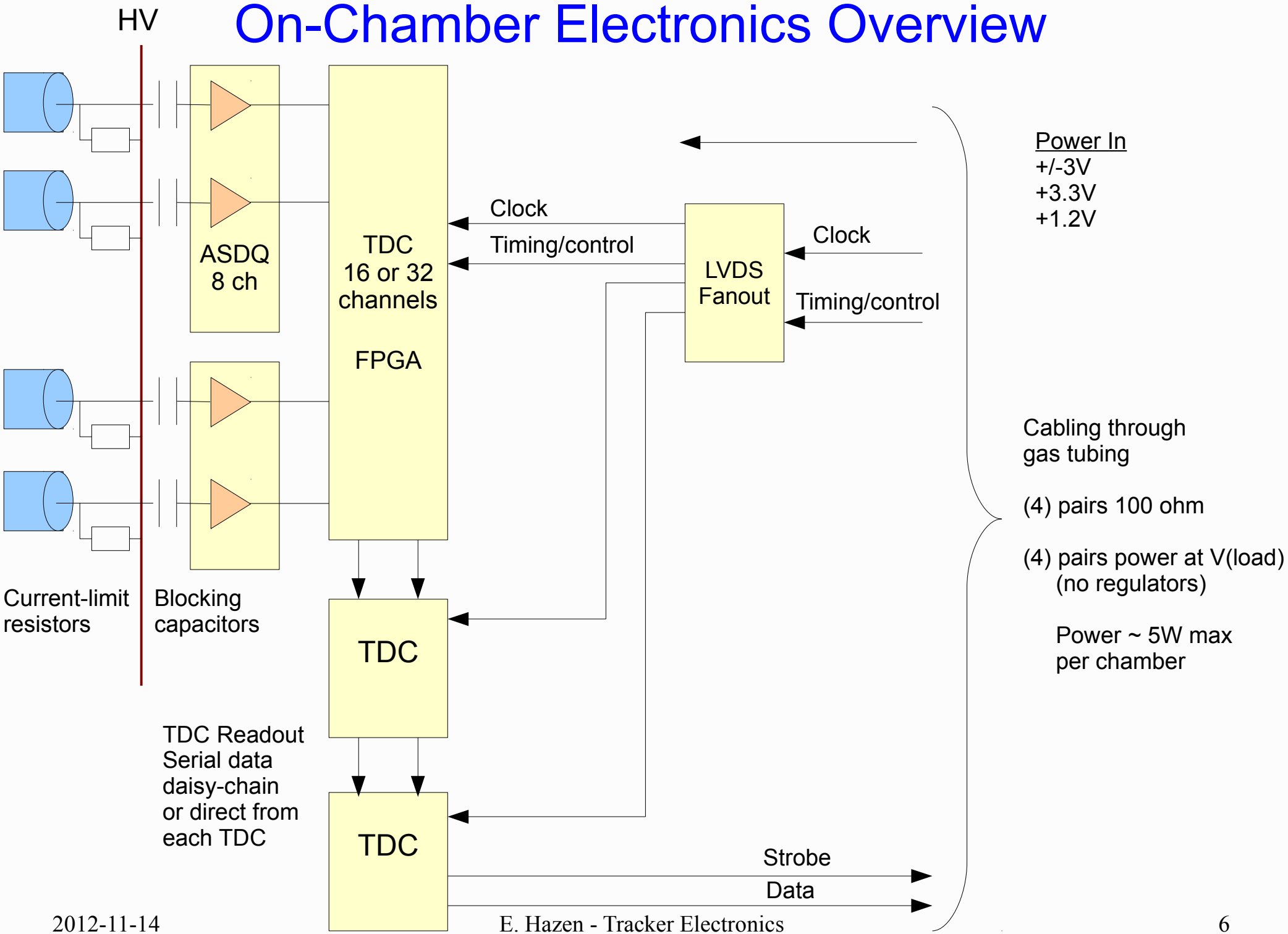
Chamber End Detail



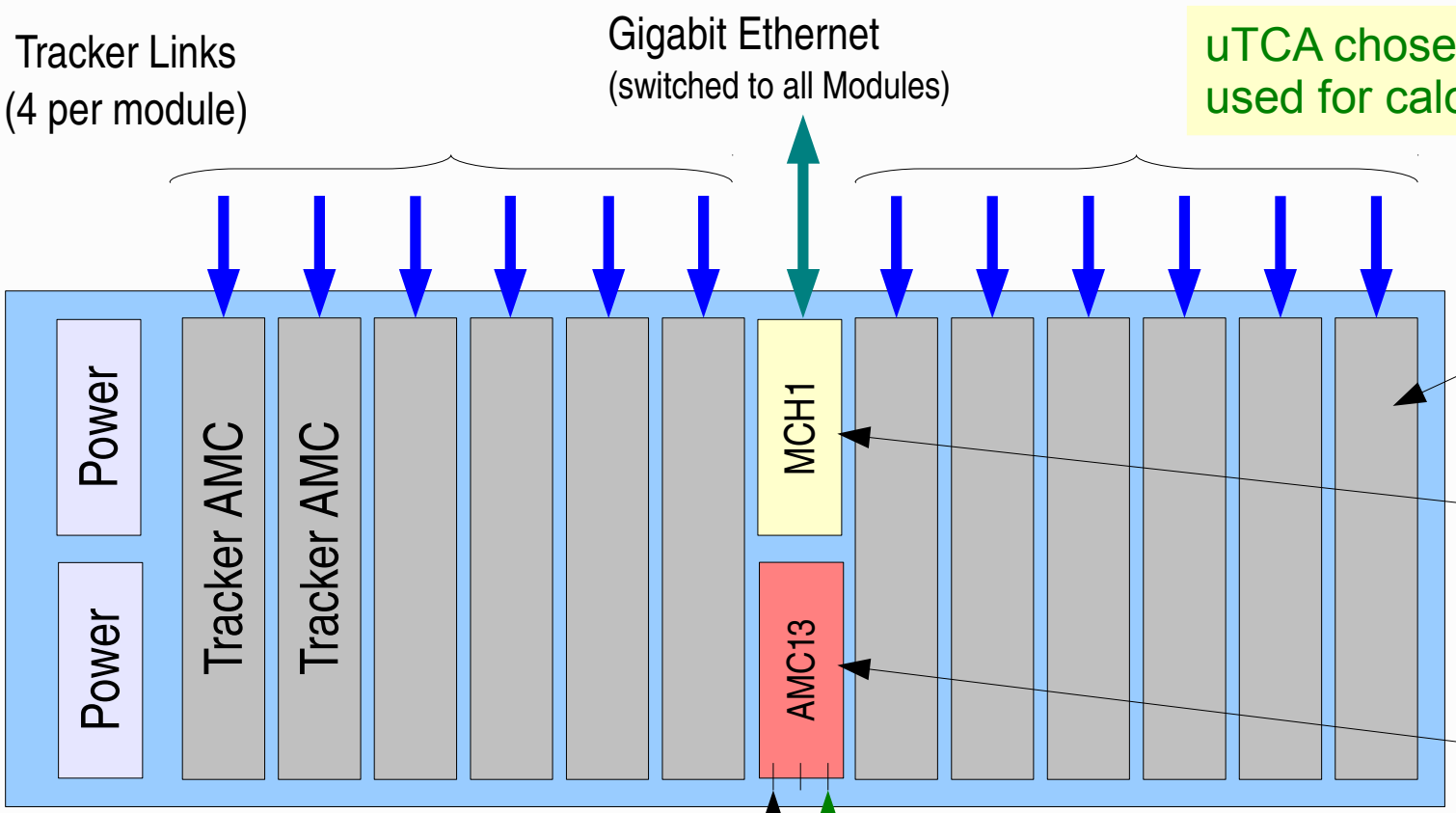
Tracker Electronics Overview



On-Chamber Electronics Overview



g-2 uTCA Tracker Crate



uTCA chosen because it is also used for calo readout...

12 AMC Slots for readout modules

Commercial MCH
- Management Ethernet

AMC13
- Clocks
- Fast controls
- DAQ

Designed at BU for CMS

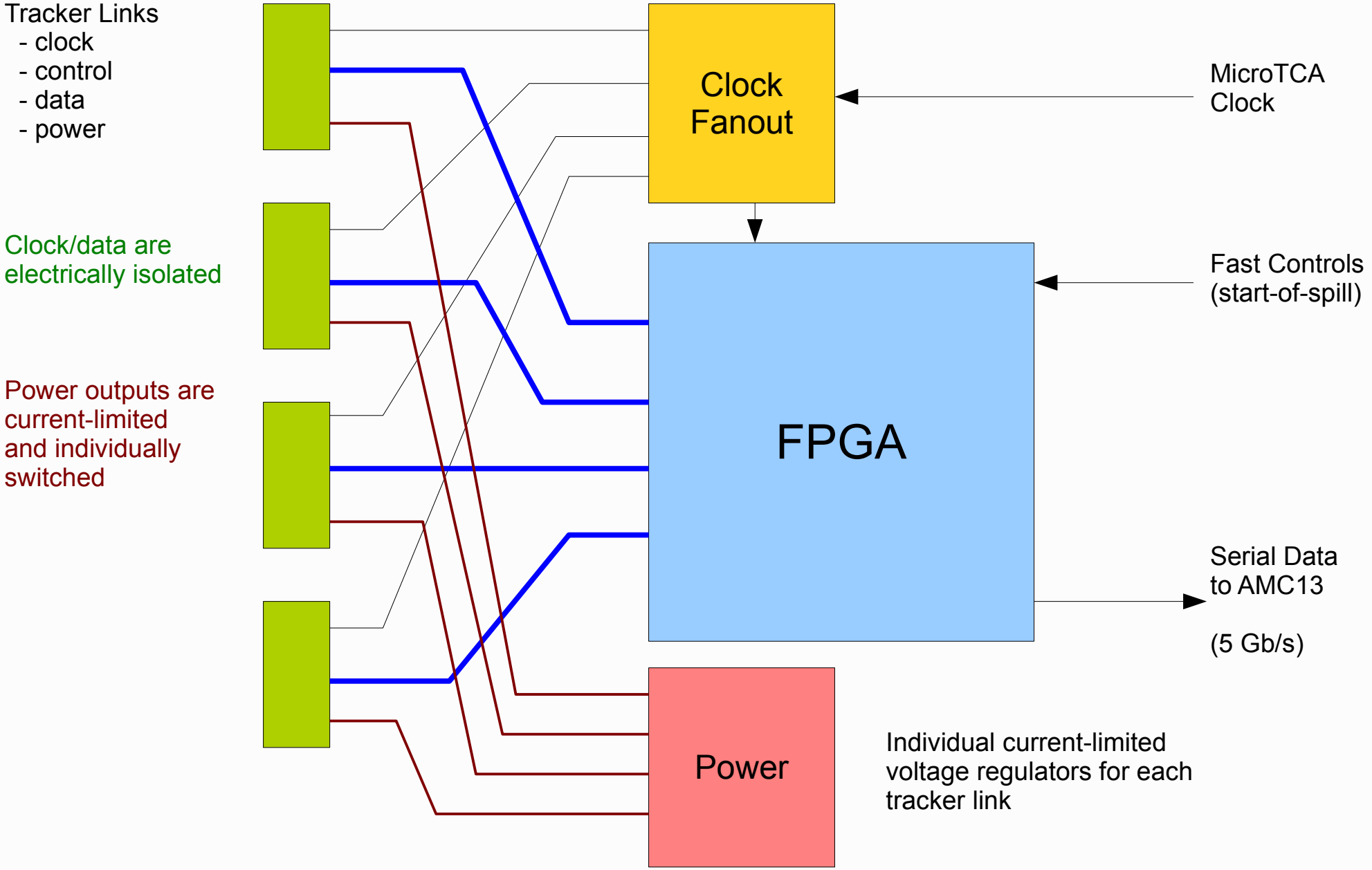
3

Clock & Controls (fiber?)

DAQ optical fibers (perhaps not needed)

Tracker Readout AMC Module

Custom design but relatively simple



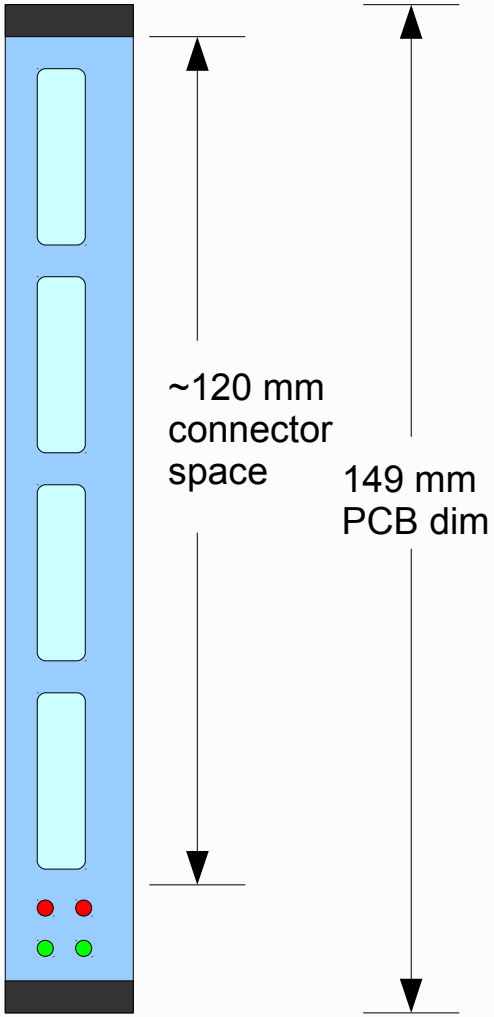
AMC Module Front Panel

Four inputs

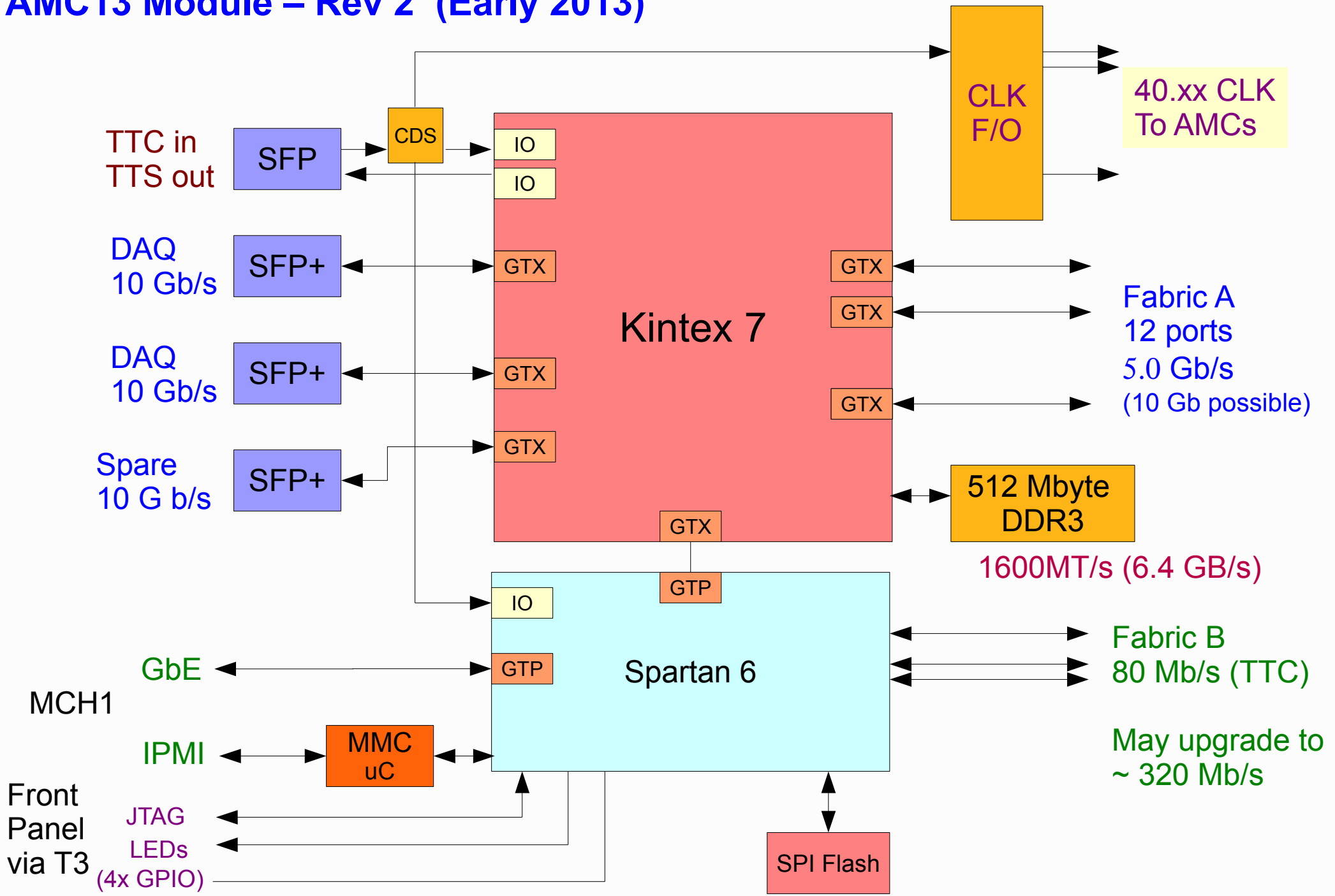
Each provides power/readout for 1/2 of a tracker chamber

5 Modules needed for 1 tracker station

Total of 10 modules



AMC13 Module – Rev 2 (Early 2013)



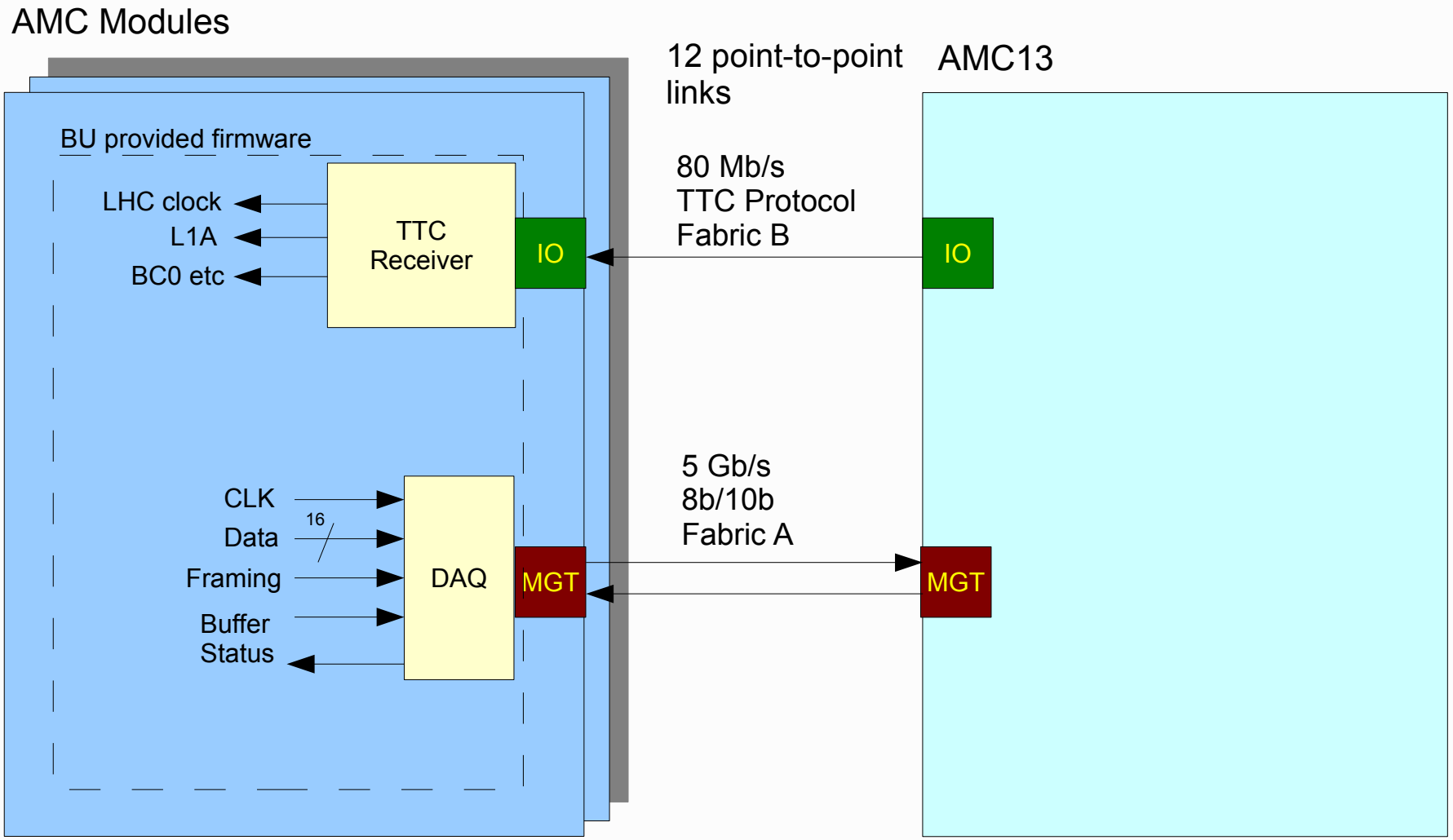
Summary / Plans

- Await input from GARFIELD simulation to fill in requirements
- Meanwhile, flesh out conceptual design and make a cost structure
- Work with Sten (front-ends) and Wu (TDC)

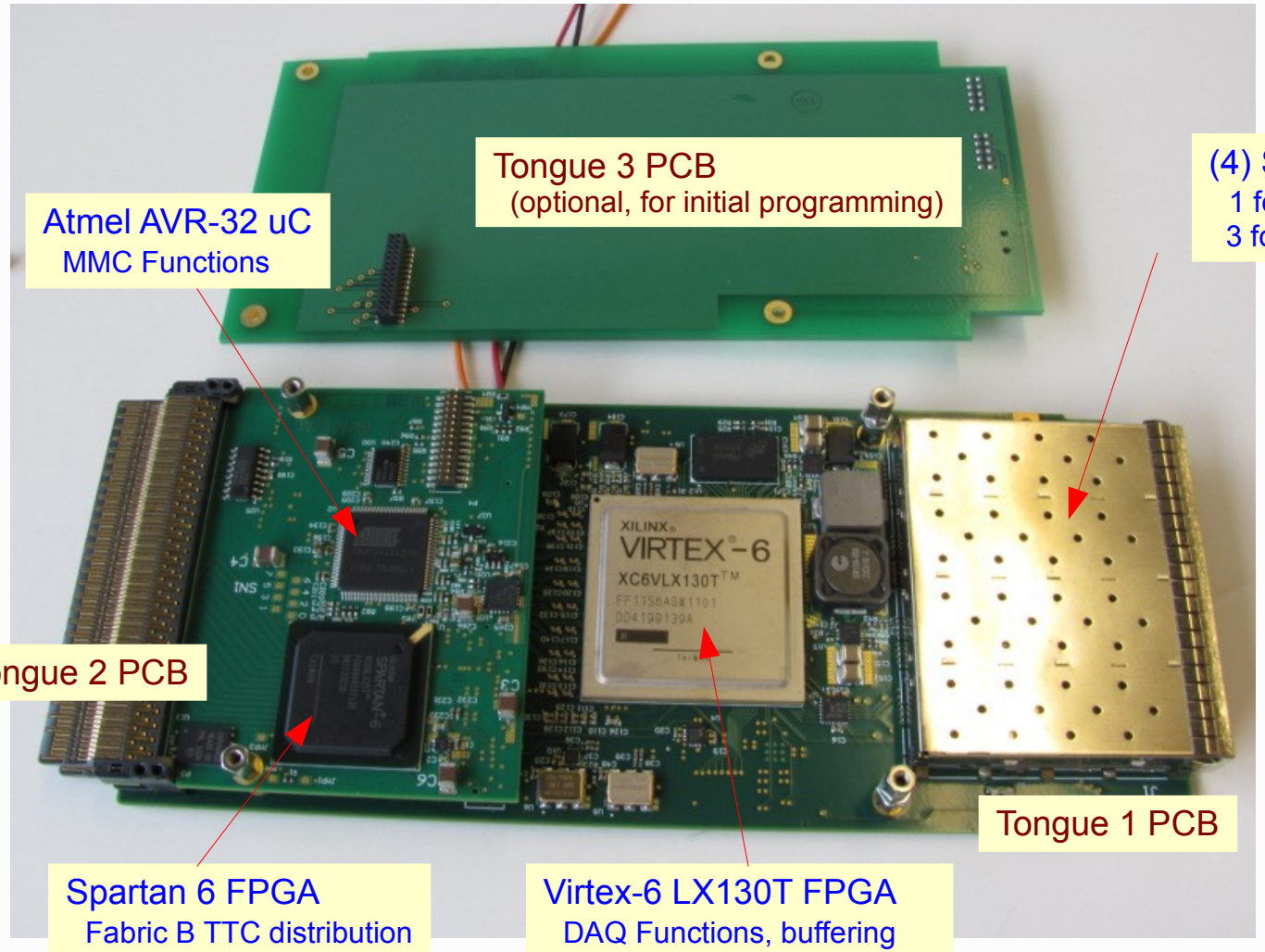
Reserve Slides

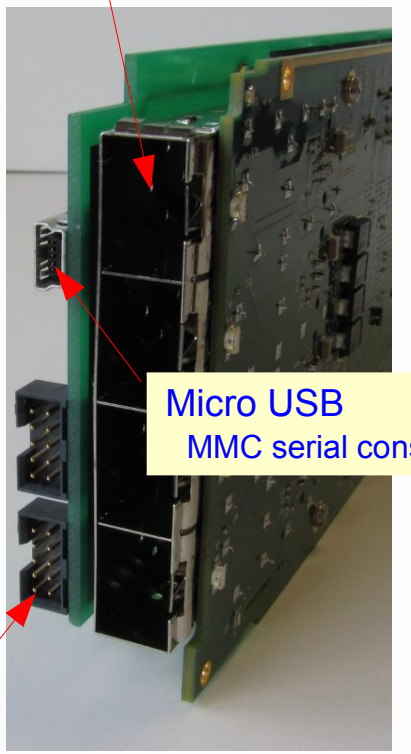
AMC13 Backplane Links - g-2

Proposed modification for G-2

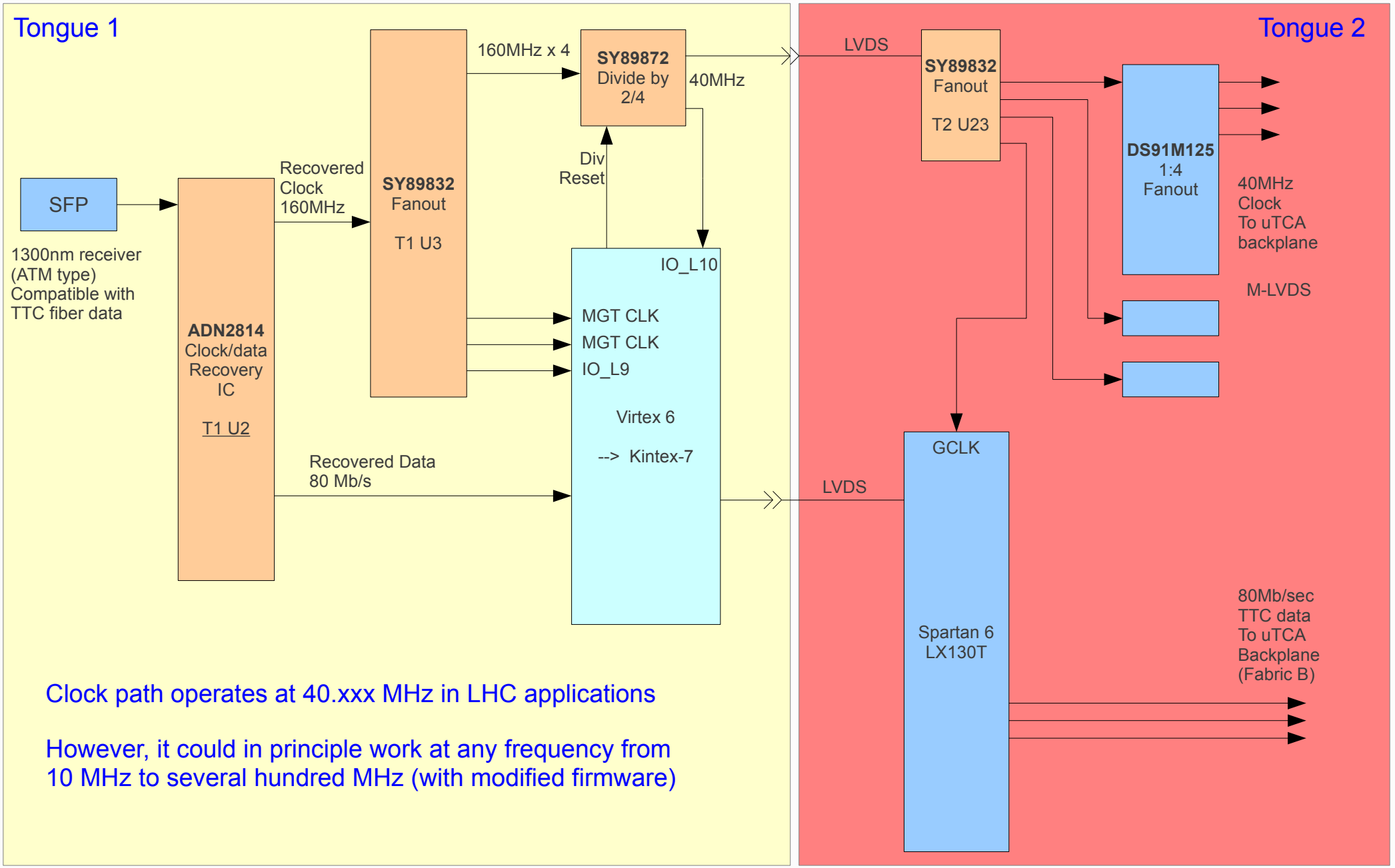


AMC13 Rev 1 Hardware





AMC13 Clocks



Clock path operates at 40.xxx MHz in LHC applications

However, it could in principle work at any frequency from 10 MHz to several hundred MHz (with modified firmware)